

Alzheimer's β -amyloid-induced depolarization of skeletal muscle fibers: Implications for motor dysfunctions in dementia

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Abstract

Numerous findings obtained over the last decades suggest that accumulation of β -amyloid peptide (β AP) plays the central role in the pathogenesis of Alzheimer's disease. It is well established that β AP has wide range of toxic effects on neurons in vitro and in vivo, however the influence of β AP in the periphery and on various other types of excitable tissues, eg. skeletal muscle cells, is almost unknown despite the many non-cognitive and other extra-neuronal symptoms associated with Alzheimer's dementia. Here we utilized conventional electrophysiological technique to investigate the effects and mechanisms of β AP action on the resting membrane potential of frog skeletal muscle fibers. β AP in the range of concentrations from 10^{-6} to 10^{-8} M produced slow, significant, reversible depolarization of muscle fiber membranes. The impact developed and was washed out faster at higher concentrations of β AP (10^{-6} - 10^{-7} M). The effect of β AP was completely absent when applied in Na^{+} -free Tris + solutions. β AP-mediated depolarization was also prevented by tetrodotoxin (10^{-5} M) pre-treatment and rescued by tetrodotoxin after-treatment. These findings suggest that β AP-induced depolarization of skeletal muscle plasma membranes can significantly disturb the functioning of skeletal muscles and therefore contribute to motor dysfunction observed in Alzheimer's disease and other disorders associated with β AP accumulation. Copyright © 2009 S. Karger AG.

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Keywords

β -amyloid peptide, Alzheimer's disease, Depolarization, Gait disorders, Muscle